

Amendments to the Claims:

1. (currently amended) A method of communication using Orthogonal Frequency Division Multiplexing ('OFDM'), the method comprising the steps of:

generating bit streams $b_n \in (0,1), n = 0, 1, \dots, K - 1$ and the corresponding sets of

frequency domain carrier amplitudes ($X_0(k)$ to $X_M(k)$), where k is the OFDM symbol number, modulated as OFDM symbols to be transmitted from a transmitter,

inserting prefixes as guard intervals in said sample streams,

transmitting said OFDM symbols from said transmitter to a receiver,

using information from said prefixes to estimate the Channel Impulse Response ($H_D^{(F)}$) of the transmission channels at the receiver, and

using the estimated Channel Impulse Response ($\hat{H}_D^{(F)}$) to demodulate said bit streams in

the signals received at said receiver, ~~characterised in that~~ wherein said prefixes ($\alpha_k \cdot c_0$ to $\alpha_k \cdot c_{D-1}$) are deterministic and are known to said receiver as well as to said transmitter.

2. (original) A method of communication as claimed in claim 1, wherein said prefixes ($\alpha_k \cdot c_0$ to $\alpha_k \cdot c_{D-1}$) comprise a vector (P_D) that is common to said symbols multiplied by at least one weighting factor (α_k).

3. (original) A method of communication as claimed in claim 2, wherein said weighting factor (α_k) differs from one symbol to another but the elements of a given vector (P_D) are multiplied by the same weighting factor.

4. (original) A method of communication as claimed in claim 3, wherein said weighting factor (α_k) has a pseudo-random value.

5. (currently amended) A method of communication as claimed in claim 1 or 2, wherein said weighting factor (α_k) is a complex value.

6. (original) A method of communication as claimed in claim 5, wherein the modulus of said weighting factor (α_k) is constant from one symbol to another.

7. (original) A method of communication as claimed in claim 6, wherein said weighting factor (α_k) is proportional to $e^{j\frac{2\pi}{N+D}m}$, where N is the useful OFDM symbol size, D is the size of the prefix vector and m is an integer.

8. (currently amended) A method of communication as claimed in ~~any preceding~~ claim 1, wherein estimating said Channel Impulse Response ($H \frac{(F)}{D}$) comprises performing a Fourier Transform on a first vector (V_{HP}) that comprises the received signal components corresponding to one of said prefixes ($\alpha_{k+1}.c_0$ to $\alpha_{k+1}.c_{D-1}$) and also the received signal components corresponding to the following one of said prefixes ($\alpha_k.c_0$ to $\alpha_k.c_{D-1}$, $\alpha_{k+1}.c_0$ to $\alpha_{k+1}.c_{D-1}$) to produce a known prefix transform ($V_{P,F}$), and performing a component-by-component division of the receiving prefix signal transform ($V_{HP,F}$) by known prefix transform ($V_{P,F}$).

9. (original) A method of communication s claimed in claim 8, wherein said prefixes comprise a vector (P_D) that is common to said symbols multiplied by weighting factors (α_k, α_{k+1}) , said weighting factors differing from one symbol to another but the elements of a given vector being multiplied by the same weighting factor, and wherein the received signal components corresponding to said one of said prefixes $(\alpha_k.c_0$ to $\alpha_k.c_{D-1})$ and said following one of said prefixes $(\alpha_{k+1}.c_0$ to $\alpha_{k+1}.c_{D-1})$ are weighted by the respective value of said weighting factor (α_k, α_{k+1}) before summing and performing said Fourier Transform to produce said received prefix signal transform $(V_{HP,F})$.

10. (currently amended) A method of communication as claimed in claim 8 ~~or~~ 9, wherein said Fourier Transforms are of dimension $D \times D$, where D is the size of said prefixes $(c_0, \alpha_k$ to $c_{D-1}, \alpha_k)$.

11. (currently amended) A method of communication as claimed in claim 8 ~~or~~ 9, wherein said Fourier Transforms are of dimension $(D+N) \times (D+N)$, where D is the size of said prefixes $(\alpha_k.c_0$ to $\alpha_k.c_{D-1})$ and N is the size of the OFDM signals between said prefixes, said first vector (V_{HP}) comprises said sum of said received signal components corresponding to one of said prefixes $(\alpha_k.c_0$ to $\alpha_k.c_{D-1})$ and of the following one of said prefixes $(\alpha_{k+1}.c_0$ to $\alpha_{k+1}.c_{D-1})$ augmented by a zero value vector (0_N^T) of size (N) to produce said received prefix signal transform $(V_{HP,F})$ of size $(N+D)$, and said second vector (V_P) comprises said known components of said prefixes $((\alpha_k.c_0$ to $\alpha_k.c_{D-1}, \alpha_{k+1}.c_0$ to $\alpha_{k+1}.c_{D-1})$ augmented by said zero value vector (0_N^T) of size (N) to produce said known prefix transform $(V_{P,F})$ of size $(N+D)$.

12. (currently amended) A method of communication as claimed in ~~any preceding~~ claim 1, wherein estimating said Channel Impulse Response ($H_D^{(F)}$) comprises combining information from said prefixes ($\alpha_k.c_0$ to $\alpha_k.c_{D-1}$, $\alpha_{k+1}.c_0$ to $\alpha_{k+1}.c_{D-1}$) for more than one symbol to obtain said estimated Channel Impulse Response ($\hat{H}_D^{(F)}$).

13. (currently amended) A method of communication as claimed in ~~any preceding~~ claim 1, wherein demodulating said bit streams comprises:
performing the multiplication by a matrix proportional to

$$R^{(1)}(k) = \sqrt{N+D} \cdot [\hat{V}] \cdot r(k), \text{ where}$$

$$[\hat{V}] = \left(\sum_{n=0}^{N+D-1} |\beta_k|^{-\frac{2n}{N+D}} \right)^{-\frac{1}{2}} \cdot \text{diag} \left\{ 1, \beta_k \frac{1}{N+D}, \dots, \beta_k \frac{N-D-1}{N+D} \right\} \quad \beta_k = \frac{\alpha_k}{\alpha_{k+1}},$$

calculating the frequency shifted CIR coefficients

$$\hat{H}_{N+D}^{\text{Shifted}, F} = \left(\hat{H} \left(\beta_k - \frac{1}{N+D} \right), \dots, \hat{H} \left(\beta_k - \frac{1}{N+D} \cdot e^{j2 \frac{N+D-1}{N+D}} \right) \right), \beta_k = \frac{\alpha_k}{\alpha_{k+1}},$$

performing a component-by-component division

$$R^{(2)}(k) = R^{(1)}(k) \otimes \hat{H}_{N+D}^{\text{Shifted}, F},$$

performing a multiplication by a matrix proportional to

$$R^{(3)}(k) = [\hat{V}]^{-1} \cdot \frac{1}{\sqrt{N+D}} \cdot R^{(2)}(k),$$

extracting the N equalized samples corresponding to the k^{th} data symbol to the vector $S^{EQ}(k)$,

and

transforming the symbol $\hat{s}(k)$ into frequency domain by performing a Fourier Transform:

$$S_F^{EQ}(k) = [F_{N \times N}] \cdot S^{EQ}(k).$$

14. (currently amended) A method of communication s claimed in ~~any of~~ claims 1 ~~to~~ 12, wherein demodulating said bit streams includes padding the received signal matrix and the operator matrices with zeros to obtain compatible dimensions for subsequent operations, multiplying the known prefix value matrix by the Channel Impulse Response estimation matrix and subtracting the result from the received signal matrix.

15. (currently amended) A transmitter for use in a method of communication as claimed in ~~any preceding~~ claim 1 and comprising generating means for generating bit streams

$b_n \in (0,1), n = 0, 1 \dots, K - 1$ modulated as OFDM symbols to be transmitted and inserting prefixes as guard intervals between said OFDM symbols, said prefixes ($\alpha_k c_0$ to $\alpha_k c_{D-1}$) being deterministic and suitable to be known to said receiver as well as to said transmitter.

16. (currently amended) A receiver for use in a method of communication as claimed in ~~any of~~ claims 1 ~~to~~ 14 and comprising demodulating means for receiving signals that comprise bit streams $b_n \in (0,1), n = 0, 1 \dots, K - 1$ modulated as OFDM symbols to be transmitted from a transmitter, with prefixes inserted in guard intervals from said transmitter to said receiver, said demodulating means being arranged to use information from said prefixes to estimate the Channel Impulse Response ($H_D^{(F)}$) of the transmission channels and to use the estimated Channel Impulse Response ($\hat{H}_D^{(F)}$) to demodulate said bit streams in the signals received at said receiver, said prefixes ($\alpha_k c_0$ to $\alpha_k c_{D-1}$) being deterministic and being known to said receiver as well as to said transmitter.